Budget Item	Program Title	Budget Request
A08c	Aeromedical Research	$6,126,000

GOALS:

The FAA safety mission dictates that:

- Injury and death patterns in civilian flight accidents be investigated and meticulously analyzed to determine cause and prevention strategies.
- Recommendations for protective equipment and procedures be developed.
- Options be evaluated on behalf of FAA regulatory and medical certification staff charged with the proposal of safety and health regulations addressing all aircraft cabin occupants.

The identification of pilot, flight attendant, and passenger medical conditions that are incompatible with in-flight physiological and performance demands, both in the absence and presence of emergency flight conditions is a concurrent mission. The resulting bioaeronautical data is to be effectively shared using advanced, user-friendly modeling and visualization technologies.

Intended Outcomes: The outcomes addressed by this research program are improved health, safety, protection, and survivability of aircraft passengers and aircrews. This research program identifies human tolerances, capabilities, and failure modes (physiological, psychological, and performance) both in uneventful flight, and during aircraft incidents and accidents. Formal recommendations for protective and supportive counter measures and techniques are derived from in-house research.

The FAA is able to exploit new and evaluate existing bioaeronautical guidelines, standards, and models for aircraft cabin equipment, procedures, and environments. This serves as a base for new regulatory action and the evaluation of existing regulations to enhance appropriate human performance at a minimum cost to the aviation industry. By reviewing pilot medical histories, flight histories along with information from accidents and incidents, existing and advanced biomedical criteria, standards and assessment/ certification procedures can be proposed to ensure optimal performance capability. By assessing pilot, flight attendant, air traffic controller, and passenger work, environmental, behavioral, and disease issues, guidelines for actions to improve the health and safety of the aircraft occupant can be proposed based on rigorous scientific criteria.

Agency Outputs: The program has developed the following guiding principles to support regulatory and certification processes:

- Quantitative bioengineering criteria to support optimum aircraft seat and restraint system certification.
- Quantitative biomedical and performance criteria to support protective breathing equipment, emergency medical equipment, and operational procedures certification.
- Quantitative bioaeronautical criteria to support flotation and onboard life support/rescue equipment certification.
- Quantitative biomedical and performance criteria to support development of optimum protective breathing equipment, emergency medical equipment, and operational procedures certification.
- Identification of biomedical/toxicological factors in aviation incidents and accidents.
- Recommendations for aircrew medical criteria, standards, assessment/certification procedures, and special issuance.
- Quantitative data about the occupational health risks of flight attendants to support regulatory oversight.
- Quantitative data about passenger behavior and health to support regulatory oversight.
- Quantitative data about the aerospace radiation environment and its threats to aircraft occupants.

Customer/Stakeholder Involvement: This program contributes to meeting the FAA Strategic Plan Mission Goal for Safety and ARA FY 2000 Performance Plan Goals for Safety and Human Factors. The program provides the primary bioaeronautical research (note: defined as the bioengineering, biomedicine, and biochemistry issues associated with safety and performance) called for in the *National Plan for Civil Aviation Human Factors*. This program contributes significantly to the application of emerging technologies, as highlighted in the FAA Aviation Safety Plan. The program is an integral participant and research provider under the FAA, Joint Aviation Authorities (JAA), and Transport Canada Aviation (TCA) Aircraft Cabin Safety Research Plan established in 1995 as a coordinated, living plan to maximize the cost-benefit of aircraft cabin safety research internationally.

International Civil Aviation Organization (ICAO) initiatives addressing the health of the aircraft occupant (crew and passenger) are developed under this program before final FAA recommendations are provided to

ICAO. This program is the only research component of the FAA that can legally access confidential medical data about pilots for use in epidemiological research studies approved by FAA's institutional review board for use of human test subjects. Multi-year collaborative studies performed by the FAA and National Institute for Occupational Safety and Health (NIOSH) into flight attendant and passenger symptomatology and diseases are funded by this budget item to satisfy the mandate placed by Congress upon the agencies in the FY 1994 Appropriation Act.

Accomplishments: Based on aeromedical research at the Civil Aeromedical Institute (CAMI), the FAA Administrator announced in FY 2000 the Agency's intention to proceed with regulations for the requirements concerning the performance and use of child restraints in aircraft. Standards and test criteria developed at CAMI are currently being considered for adoption by the Society of Automotive Engineers (SAE). Specialized quantitative crashworthiness assessments for aircraft continued, inclusive of side-facing aircraft seats, and included the use of new state-of-the-art anthropomorphic test dummies with enhanced injury assessment capabilities.

Data are continuously provided to the research sponsor on the role of toxicological and clinical factors associated with each aircraft accident and significant incident. Current findings indicate that about one of six pilots fatally injured in a civilian aircraft accident show evidence of using a prescription drug; one of four has taken an over- the-counter drug; one of 25 has ingested significant positive alcohol; and 1 of 20 is using a significant controlled dangerous substance. Long-term aviation forensic and epidemiological research has helped the FAA to identify bioaeronautical roles in accident/incident causation. Specialized clinical evaluations have been applied to cases associated with aircraft decompression. Medical and other factors indicative of pilot incapacitation and inability to perform optimally are under continuous evaluation. To promote radiation safety in civil aviation, instructional materials on radiation exposures in-flight were provided to the aviation industry.

R&D Partnerships: In addition to the previously described partnerships (e.g., FAA/JAA/TCA; FAA/NIOSH), academic, industrial, and other governmental coordination and cooperation are maximally leveraged in all research activities. In each of the program area output categories, the FAA maintains direct cooperative research processes with all the manufacturers responsible for the safety products enumerated (seats, restraint systems, oxygen masks, evacuation slides, etc.). FAA investigators also maintain memberships on every Society of Automotive Engineers committee addressing safety research conducted under this program. The agency maintains a liaison with the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) committee addressing aircraft cabin air quality status and research. Besides the active involvement in the FAA/JAA/TCA process of oversight for safety research, participants in this program are represented on appropriate subgroups of organizations such as the Aerospace Medical Association, the Civil Aviation Medical Association, and the Professional Aeromedical Transport Association. Appropriate liaison with the all military branches is maintained either through direct project collaboration (e.g., crashworthiness, aerospace medicine, eye injury from lasers, exposure to cosmic radiation), through participation in the North Atlantic Treaty Organization aerospace medical advisory groups, the European Union, or collaborations in scientific organizations.

MAJOR ACTIVITIES & ANTICIPATED FY 2001 ACCOMPLISHMENTS

The following program results have been achieved or are expected to be achieved in FY 2001:

- Performed epidemiological assessment of biochemical and toxicological factors from fatal civilian aviation accidents.
- Assessed the results of automatic external defibrillators on commercial aircraft.
- Evaluated autopsy data from fatal aviation accidents to determine protective equipment and design practices.
- Assessed flight attendant reproductive health hazards (Congressionally requested FAA-NIOSH study).
- Identified key factors affecting safety associated with child restraints in aircraft.
- Developed a performance-based standard for crew protective breathing and vision equipment (CPBVE).
- Proposed changes to regulations for operational aviation hazards of laser exposure to humans.

KEY FY 2002 PRODUCTS & MILESTONES

The following program results are being scheduled in FY 2002:

- Develop medical data that will support aeromedical certification aimed at reducing in-flight sudden/subtle incapacitation.
- Evaluate autopsy data from fatal aviation accidents to determine protective equipment and design practices and aircrew medical certification standards.
- Provide guidelines for aircraft cabin occupant health maintenance, including verifying the CARI-6 radiobiologic computer program that covers large solar particle events.
- Assess optimum wide-body exit distribution and access using the 747 evacuation simulator (if simulator construction is completed.)
- Develop improved fit and comfort standards for oxygen mask systems.
- Evaluate pilot reported medication usage with actual toxicology findings to detemine the accuracy of self reporting.
- Evaluate the safety record of pilots with a statement of demonstrated ability (SODA) in support of aeromedical certification standards.

FY 2002 PROGRAM REQUEST:

The Office of Aviation Medicine encounters complex medical decisions during the initial and follow-up medical assessments of airmen who request special medical issuances (e.g., cardiac conditions, neurological deficits, etc.) to permit their continued flying. The prospective epidemiological assessment of special issuance methodology and medical outcomes in the airman population is required to ensure that medical issuances do not result in unexpected or increased aircraft accident or incident rates or risks.

Ongoing research projects will:

- Support safer aircraft cabin evacuation approval guidelines and safer field applications under routine and emergency operational conditions.
- Reduce head, neck, torso, and extremity injuries in aircraft crash environments.
- Evaluate trends in toxicological, biochemical, physiological, and clinical findings from all major civil aviation aircraft crashes.
- Assess guidelines for aircraft cabin crew and passenger environmental management.
- Assess performance of new cabin aisle marking systems for use during emergencies.
- Assess effectiveness of new programs dedicated to the enhancement of passenger performance in emergencies.
- Evaluate the use of AEDs and make rulemaking recommendations.
- Evaluate in-flight use of medical kits and determine the adequacy of those kits.
- Track special medical issuance pilots to evaluate relative risk and the continuance of specific aeromedical certification standards.
- Provide recommendations for limits to radiation exposure (laser and ionizing).
- Develop an advanced aeromedical research accident database that is user friendly, has rapid response, and produces advanced statistical and graphics analysis.
- Develop dynamic modeling capabilities in support of cabin safety research, biodynamic protection/ survivability research, and aircraft accident investigation research.

APPROPRIATION SUMMARY

	Amount ($000)
Appropriated (FY 1982-2000)	$71,616
FY 2001 Enacted	6,000
FY 2002 Request	6,126
Future Requirement	TBD
Total	$83,742

Budget Authority ($ 000)	FY 1998 Enacted	FY 1999 Enacted	FY 2000 Enacted	FY 2001 Enacted	FY 2002 Request
Contracts					
Aeromedical Research	0	313	394	951	500
Personnel Costs	3,320	3,155	3,858	3,893	4,265
Other Inhouse Costs	680	597	577	1,156	1,361
Total	**4,000**	**4,065**	**4,829**	**6,000**	**6,126**

OMB Circular A-11, Conduct of Research and Development ($000)	FY 1998 Enacted	FY 1999 Enacted	FY 2000 Enacted	FY 2001 Enacted	FY 2002 Request
Basic	-	-	-	-	-
Applied	4,000	4,063	4,829	6,000	6,126
Development (includes prototypes)	-	-	-	-	-
Total	**4,000**	**4,063**	**4,829**	**6,000**	**6,126**